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ABSTRACT

This paper offers insights on how to facilitate student-student interaction in the science classroom. These insights derive from the education and the linguistics literature. Cooperative learning research offers a means of understanding what helps groups of students interact successfully. Systemic functional linguistics provides tools for analyzing how people use language to achieve various aims. In this article, cooperative learning and systemic functional linguistics are first described. Next, they are used to analyze a transcript of student-student interaction from an elementary school science classroom. Then implications are suggested as to how these two areas of inquiry can inform improved teaching practice. Particular emphasis is placed on the teaching of collaborative skills. Interaction plays a crucial role in learning, and even at an early age interaction is crucial. Successful interaction depends a good deal on skill on the part of the interactants. With specific reference to learning at school, constructivist and Vygotskian views both stress the value of student-student interaction. Ideas are illustrated and disseminated for enhancing interaction. The paper is divided into three sections: the first presents a brief introduction to cooperative learning (CL) and systematic functional (S/F) linguistics; the second focuses on using early CL and S/F linguistics to analyze a small bit of interaction of 3 primary school students; and the final section suggests how insights from CL and S/F can in tandem inform pedagogy. (Contains 56 references and 2 appendices.) (KFT)

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Analysing Student-Student Interaction from Cooperative Learning and Systemic Functional Perspectives

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Abstract

This article attempts to offer insights on how to facilitate student-student interaction in the science classroom. These insights derive from two sources, one from the education literature and the other from the linguistics literature. From the pedagogic sciences, cooperative learning offers a means of understanding what helps groups of students interact successfully. From the science of language, Systemic Functional linguistics provides a tool for analyzing how people use language to achieve various aims.

In the article, cooperative learning and Systemic Functional linguistics are first described. Next, they are used to analyze a transcript of student-student interaction from an elementary school science classroom. Then, implications are suggested as to how these two areas of inquiry can inform improved teaching practice. Particular emphasis is placed on the teaching of collaborative skills.

It is perhaps an understatement to say that Interaction plays a vital role in learning. As Wells (1985: 3) has observed, even at an early age, interaction is

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crucial:

> It is only from interaction with other people in particular situations that the child can discover the appropriate ways of deploying his [sic] resources to achieve particular intentions – or indeed discover the existence of the linguistic code in the first place.

However, successful interaction depends upon a good deal of skill on the part of the interactants. Nicholls and Wells (1985: 6) state that:

> [S]ocial interaction requires the development of sophisticated communication skills. These, in their turn, entail the development of cognitive schemes about oneself and others, and about the ways in which people and objects can be related in an inter-subjective field of attention.

With specific reference to learning at school, constructivist (Shapiro, 1994) and Vygotskian (Wertsch, 1985) views both stress the value of student-student interaction. Through this paper, we hope to illustrate and disseminate ideas for enhancing such interaction. The paper has three sections. The first presents a brief introduction to cooperative learning (CL) and Systemic Functional linguistics (S/F). The second section focuses on using CL and S/F to analyse a small bit of interaction of three primary school students. The final section suggests how insights from S/F and CL can in tandem inform pedagogy.

Section 1 - A brief introduction to cooperative learning and Systemic Functional linguistics

Cooperative learning

Cooperative learning can be defined as principles and strategies for enhancing the value of student-student interaction. CL does not mean that students must do everything in groups. While group activities play a significant role in learning, whole class instruction and individual work continue to have an important place in education. A key point is that CL represents much more than just asking students to shove their desks together and work as a group. As Nicholls and Wells note above, collaboration is not easy; guidance of one form or another will often be useful. (For a list of Internet resources on CL, see Appendix 1.)

While the roots of CL can be traced to the nineteenth century and even earlier (Johnson & Johnson, 1994), the 1970s marked the beginning of a trend toward more research on CL and the practical development of many CL approaches and strategies. CL practitioners find theoretical support from a wide range of educational theories and philosophies, from behavioural to humanistic (Slavin, 1987), but a key source of inspiration has been social psychology (Deutsch, 1949; Lewin, 1935).

Cooperative learning derives support not only from theory, but from research as

well. Indeed, CL is one of the best researched areas in education with many hundreds of studies being conducted in a wide range of subject areas, including languages, with students at a wide range of education levels, from lower primary to graduate school, and in a wide number of countries, although the majority of the studies we are aware of have been done in North America. Overall, this research suggests that CL is associated with increases in achievement, higher order thinking, inter-group relations, and a range of affective variables, such as self-esteem and liking for school (for reviews, see Bossert, 1988-1989; Cohen, 1994b; Johnson & Johnson, 1989; Sharan, 1980; Slavin, 1995). Many of the explanations for these generally favourable results credit students' increased and more varied use of language when working in CL groups (Johnson & Johnson, 1999; Webb, 1989).

Approaches to CL differ along several dimensions. In the forthcoming analysis, we will highlight the following principles used by at least one prominent approach to CL (Kagan, 1994):

1. Positive interdependence: The feeling of support among group members such that they feel that the group sinks or swims together, as opposed to negative interdependence where group members feel that what helps one member hurts others and what hurts one member helps others, or no interdependence where group members see no relation between individual member's task outcomes.

2. Individual accountability: The feeling of pressure for each member of the group to learn, display their learning, and help others learn.

3. Collaborative skills: The explicit teaching of skills needed for students to function well in groups, e.g., disagreeing politely, encouraging all to participate, explaining by using examples, and asking for examples. Collaborative skills have many non-classroom uses as well. These skills have verbal and non-verbal aspects, and their use differs across cultures and contexts. Section 3 of this paper returns to collaborative skills, as this is perhaps the area in which CL most directly overlaps with S/F.

4. Equal participation: All group members have opportunities to take part in group activities.

5. Simultaneous interaction: Many students in the class are speaking at the same time, as opposed to sequential interaction in which only one person in the class – either the teacher or a student the teacher has called on – is speaking. Small groups facilitate this, because with groups of 4, twice as many students are potentially speaking than with groups of 8; this doubles again with groups of 2.

Systemic Functional linguistics

The 'systemic" in Systemic Functional linguistics derives from the fact that linguists working in this tradition see language as a *system* of choices that accounts for the meanings people make in using a language (Halliday 1985). The word 'functional' is used because people make these choices based on the *functions* for which they seek to use language. S/F focuses on the ways in which language serves as a tool for communication and on how people choose which bits of language to deploy. Thus, language is not studied as a decontextualized, ideal entity but rather as a product and a process affected by and affecting the social contexts in which it occurs.

Although S/F sees language as a tool for carrying out many functions, three metafunctions of this tool have been identified by S/F linguists: ideational, interpersonal, and textual. Butt, Fahey, Spinks, and Yallop (1995: 12) describe these metafunctions as follows:

1. Ideational: we use it to encode our experience of the world; it conveys a picture of reality.
2. Interpersonal: we use it to encode interaction, and to show how defensible we find our propositions.
3. Textual: we use it to organize our representational and interpersonal meanings into a linear and coherent whole.

While any one text, spoken or written, will include all three metafunctions, it can nevertheless be characterized as overall fitting within one of the three metafunctions.

Halliday, following on from Malinowski (1922) and Firth (1957), suggested that language needed to be looked at in context, the Context of Culture and the Context of Situation. For him, language assumed meaning only when seen in context. His work focused on the need to look at the Context of Situation. To define the Context of Situation, he suggested that analysts needed to look at three parameters, field (the subject of the text), tenor (the relationships between those involved in the text) and mode (the medium through which the text is transmitted). Together these three parameters help to select the register, or type of language that is likely to be used in the text.

Later researchers in the Hallidayan tradition such as Martin (1993) have given added weight to the Context of Culture. For them, culture determines different forms of text for achieving particular purposes. Purpose is the factor that tends to determine our choice of genre or the type of text that a culture has determined as the most appropriate to achieve that purpose. For example, the narrative genre and its structure is delimited by the culture. Within the given culture of, say, a school in Australia, a narrative is expected to have a certain structure and to include certain language features. This is the macro level. At the micro level, the context of situation, as defined by field, tenor and mode, will be associated with certain language, or register.

S/F has an activist bent. A key goal lies in helping people to better express themselves and to better understand what others are attempting to do via the texts that they create. S/F seeks to empower people to be more skilled, more analytical language users by helping them see the language choices available within any particular context and to understand what consequences are related to the choices made. Therefore, it is not surprising that many educators in language education and other areas have found that S/F offers useful guidance.

Section 2 - Analysis of data

The data for this analysis were used in an earlier paper (Kamen, Roth, Flick, Shapiro, Barden, Kean, Marble, & Lemke, 1995) in which each of the eight authors used their varied theoretical perspectives to analyse a 2.5 minute video of three male North American fourth and fifth grade students working together on an open-ended, hands-on engineering task: the creation of a tower. The students, Andy, Simon, and Tim, speak in their native language: English. The theoretical and methodological perspectives used by the authors were: Vygotskian, situated cognition, discourse analysis focusing on embedded and displaced speech, constructivist analysis of patterns of language use and action, grounded theory, analysis of power and status with the group, Wittgensteinian, and systemic-functional. The authors of the current paper used only the transcript (Appendix 2) and the Kamen, et al. paper for our analysis, as we were unable to obtain access to the video. The transcript is divided into a total of 63 fragments, each of which is usually a speaking turn by the three students and one other student who briefly joins their group. The main analysis began with fragment #30.

Cooperative learning

We organized our analysis of the transcript by using the five CL principles briefly described in Section 1.

<u>Positive interdependence</u>

Positive interdependence, along with individual accountability, are CL principles highlighted in all the approaches to CL with which we are familiar. Johnson and Johnson (1994) state that positive interdependence lies at the heart of CL and cite research suggesting that interaction without structuring for positive interdependence is less facilitative of learning than interaction with structuring for positive interdependence (Lew, Mesch, Johnson, & Johnson, 1986). They describe nine ways of attempting to foster positive interdependence among students. It is not their claim that all nine need to be used for every lesson, rather they maintain that using more may increase the prospect that positive interdependence will be felt and felt strongly.

It should be stressed, however, that the key to determining whether positive interdependence exists lies not in what the teacher does or the materials say (these can only facilitate) but in group members' minds. The first means of encouraging positive interdependence is positive *goal interdependence*, i.e., students have a clearly-defined objective for their group, and none can succeed unless all succeed. In the case of our group of three, they do have a common goal: to work together to design and create a single product, a tower. In fragment 16, Simon criticizes what Andy is doing, because he feels it will keep the trio from reaching their goal: "This won't work".

Johnson and Johnson (1994) explain that "*resource interdependence* is structured when each member has only a portion of the information, materials, or resources necessary for the task to be completed, and members' resources have to be combined in order for the group to achieve its goal" (p. 83). For instance, in a well-known CL technique, Jigsaw (Coelho, Winer, & Winn-Bell Olsen, 1989), each group member is given unique information. They form new teams with members of other groups who have the same piece of information. These "expert teams" study their piece together before returning to teach it to the members of their "home team", after which the home team does a task requiring knowledge of all the pieces, e.g., individually take a quiz. Positive resource interdependence does not appear to have been structured in this lesson, as nothing in the transcript indicates that any member of the group has been given unique access to any information or materials.

Positive *role interdependence* can be structured by each member of the group taking roles necessary to completion of the group's task. It is not clear whether the teacher made an effort to structure for this type of positive interdependence. This could have been done in several ways. For instance, students could have rotated various roles: critiquer, giving each other feedback on what the other had constructed, perhaps using criteria from an outside source, e.g., the textbook or teacher, or ones the class had developed; questioner, asking each other questions about the how and why of how each had built their piece; or praiser, pointing out good aspects of each other's contributions. Unlike the previous roles that rotate during each activity, roles that might rotate only once a class include noise monitor, who encourages members to speak softly; time keeper, who helps the group remain aware of time limits; and reporter, who shares what the group has done with other groups. No specific role assignments seem to have been used by the three students in the transcript.

Positive *identity interdependence* resembles the feeling among members of a sports team who forge a common identity via a team name, colours, mascot, song, etc. In classrooms, some ways that teachers attempt to use this path to positive interdependence involve groups choosing a name (sometimes related to the subject area, e.g., *comets* in science class) or using a special group handshake or cheer to celebrate the group's success. This type of positive interdependence did not appear to be in evidence here.

Fantasy interdependence exists when students pretend that their group are different people, in a different place, or in a different time. None of this seemed to be the case with the group in the transcript; however, it might have been easy for the group to imagine they were, e.g., architects working on a bid to design a tower, perhaps one with futuristic features.

Outside enemy interdependence involves groups in working together to overcome common adversaries. These could be human adversaries in the case of one sports team trying to defeat another, or some type of standard, such as when a relay team in track tries to improve on their previous fastest time. This way of fostering positive interdependence did not seem in evidence in the transcript, but could have been included, e.g., by putting the building to some kind of test such as a simulated earthquake, with the group attempting to construct a tower that could withstand the force of the quake.

Positive *task interdependence* involves each member of the group having a separate task, with the accomplishment of the group's goal hedging on each group member completing their task. Such task interdependence appears to have been the case among the three students, as each had been charged with building one part of the tower, after which their three parts would be combined.

Positive *environmental interdependence* simply means that students are close together so that they can easily hear each other and share resources. Often, from across the room one can see that a group is not functioning well because one or more of the members are apart from the rest of the group. In his contribution to the earlier analysis of the transcript, Lemke (in Kamen, et al., 1995) includes a non-verbal dimension. Without using the term, he notes several instances where environmental interdependence came into play. In 17-28, when a fourth student tries to intrude on their group, Lemke believes that because Andy, Simon, and Tim formed "a fairly tight group" they were able to "defend" themselves against the intruder Sam, who soon walked away. Next, in the portion of the transcript beginning at 30 in which Andy and Simon oppose Tim's design for his section of the tower, Andy and Simon are close together while Tim is apart. Thus, the distance between their physical positions mirrors the difference in their positions on the design of the tower. Lemke notes that later as Andy's and Tim's views converge, so too do they move physically closer, while Simon moves further away as Andy and Tim talk with each other, seemingly ignoring Simon's talk about a pyramid.

A ninth means of encouraging positive interdependence is what Johnson and Johnson (1994) call *reward/celebration interdependence*. This involves students receiving a reward, such as points, praise, or something tangible, e.g., sweets, based on the level at which they accomplished their group goal, or the group celebrating their success together. Two major controversies in this area concern the efficacy of extrinsic motivation and the fairness of group grades. We have no

knowledge as to what was going to happen with their tower, whether it would be graded or presented to the class.

Individual accountability

CL methodologists have developed many ways of encouraging each student to participate in their group, to learn, and to display their learning (Johnson & Johnson, 1994; Kagan, 1994). Among these are:

1. Each member individually takes a quiz.
2. One group member is called on at random to present and explain their group's work, either to the whole class or to another group.
3. Students check or edit each other's work.
4. Each member has to teach, explain, or contribute an idea or information to one or more of their fellow group members.
5. Each member has principal responsibility for a particular role or task.
6. Group size is kept small, i.e., from two to four.

In the case of the interaction in the transcript, the main way that individual accountability seemed to be encouraged was that each group member was responsible for one part of the tower.

Simultaneous interaction and Equal participation

Simultaneous interaction seemed to be taking place if we assume that while our three friends were talking to one another, similar discussions were taking place in other groups. Thus, several or perhaps many discussions were going on simultaneously in that classroom. The small size of the observed group and presumably the other groups helped to increase the potential number of simultaneous conversations. We do not know what was to take place after students had finished their towers. If each group was to come to the front of the class to display and explain their tower, this would involve sequential interaction. In contrast, if groups were to present to other groups via techniques such as Gallery Tour (Kagan, 1994), simultaneous interaction would still prevail.

Equal participation can be encouraged in many ways, overlapping with means of facilitating positive interdependence and individual accountability. Participation among the three group members was fairly equal with each taking 17 turns. Words spoken were fairly even – Simon 112 words, Tim, 97 words, and Andy 78 words. Kean (in Kamen, et al., 1995) looked at the number of communication units and counted 15 for Tim, 13 for Andy, and 11 for Simon. Perhaps this roughly equal participation was encouraged by the small group size, and by the fact that each had control over their piece of the group project, so no one could be ignored, because all three members had some stake in each other's part, since all the sections had to fit together.

Collaborative skills

The skills that students need to work successfully as a group can be divided into

two types: group maintenance skills and idea skills. Group maintenance skills are those needed to get the group operating, e.g., taking turns, arranging the furniture, keeping the volume at an appropriate level, encouraging others, and keeping track of the time. Idea skills are those that focus on the content being learned, e.g., asking for explanations, giving examples, disagreeing constructively, summarizing what the group has said, and using analogies to explain ideas.

What was particularly noticeable in the transcript, as pointed out by both Flick and Shapiro (in Kamen, et al., 1995), was the fact that the students did not give explanations to support their statements. For instance, in 40-47 they engage in what Shapiro calls "chanting" to defend their views. Flick states that, "In classrooms where science is effectively taught, important learning is often forged from verbal negotiations as well as from evidence and experience" (p. 10). Along similar lines, Webb (1989) conducted research with primary school students learning mathematics in groups that were formed so as to mix students based on past achievement. She found that both high and low achievers benefited when lower achievers requested and received explanations, but no one benefited when answers without explanations were provided or requests were ignored. While Andy does take a more reasonable approach than Simon and eventually succeeds in getting Tim to agree that his design needs modification, even Andy does not refer to the scientific concepts that one assumes their teacher had hoped would emerge.

Collaborative skills have a verbal aspect, i.e., the words used, as well as a non-verbal aspect, i.e., tone of voice, facial expressions, gestures, posture, proximity to others. Barden (in Kamen, et al., 1995) notes that in the video she heard a range of tones of voice, from supportive to sarcastic. However, it is not possible for the present writers to comment on this as the video was not available. Another non-verbal aspect of collaborative skills is proximity. This was discussed earlier under environmental interdependence, and both Barden and Lemke emphasize its importance.

Systemic Functional analysis

In Systemic Functional (S/F) analysis of written genre, it is common to analyse the structure of a text and the language used. However, in this extract of spoken language, it is difficult to come up with a text structure analysis that would help classify the excerpt as being a member of any particular genre. The conversation moves forward on what appears to be a very ad hoc basis with the dialogue closely linked to the actions of the participants. This is typical of naturally occurring spoken interaction as noted by Burns and Joyce (1997: 9-10).

> Spoken texts, on the other hand, are more open-ended and dynamic, and may be much more closely tied to the actions occurring in the immediate context, with one utterance leading to another... Speech is dynamic, therefore it is much more difficult for the speakers to predict the exact direction the interaction will take.

However, what we can do is to analyse the language and see how the chosen language relates to the ideals of cooperative learning. Our assumption here is that, of Halliday's (1978) three metafunctions, the most relevant to cooperative learning is the Interpersonal Metafunction, i.e., the function that relates to the Tenor of the Context of Situation or the relationship between the participants. It is this function, therefore, that we shall examine in detail.

The areas of the grammar most closely associated with the Interpersonal Function are mood, polarity, modality, and personal pronouns (Halliday, 1978). Again, we would like to make some assumptions here. We are assuming that to achieve the kind of cooperative atmosphere that is our aim in cooperative learning students should be encouraged to use certain kinds of language. For example, we might expect students to most often use interrogatives to elicit information and opinions from their fellow group members rather that issue statements of their positions or imperatives that try to force others to follow their point of view.

Mood

The table below gives the analysis of mood in the script. By mood (Halliday, 1985), we are referring to whether the piece of language under focus is a statement, an imperative, or an interrogative. This relates to the interpersonal as, for example, the interrogative reverses the roles in a statement. In a statement, the speaker seeks to give information; in a question, the speaker seeks to receive information. Imperatives tend to suggest domination, while interrogatives suggest cooperation. (Note that it was not possible to categorise all fragments according to mood, etc. and that Sam's contributions have been ignored throughout the analysis.)

Table 1: A Summary of Mood in the Script

	Tim	Andy	Simon
Statements	14	12	14
Imperatives	3	2	5
Interrogatives	3	3	2

The preponderance of statements in the text suggest that there is little in the oral interaction that would encourage the students to cooperate with each other. The three participants seem to prefer to simply state their own ideas rather than elicit the opinions of others. There is even a total lack of tag questions, which would have formed a halfway position between bald statements of opinion and requests for such information as another's opinion. (See Halliday, 1985: 69.) The one fragment that does give a feel of cooperation is the very last in the script when Tim makes a suggestion that includes the others – "Let's make it sort of like the empire state building." (See Halliday, 1985: 347 where he calls such

forms imperative 'we'.)

Personal pronouns

The use of personal pronouns is also of interest here. Apart from the last fragment mentioned above, there are only nineteen uses of personal pronouns. This represents less than half of the statements and interrogatives used. Tim uses ten of the nineteen and five of the ten are 'I'. Simon uses seven, of which four are 'you'. Andy only uses two personal pronouns throughout the extract. Only five of the personal pronouns used are 'we'. This again gives the impression of three individuals rather than a cohesive group. Table 2 summarises the data.

Table 2: Distribution of Personal Pronouns

	Tim	Andy	Simon
I	5	1	1
You	3	0	4
We	2	1	2

Polarity

Polarity simply refers to whether clauses are positive or negative. In the transcript, we find a total of twelve fragments containing negatives, two of Tim's, three of Andy's and seven of Simon's. These negatives tend to come in clusters. Thus we have five of Simon's negatives in fragments 7-16 where Simon is questioning Andy's contribution. Another cluster appears in the section where Andy and Simon together question Tim's contribution. In this section, the dialogue seems to deteriorate to the 'Yes, it is – No, it isn't' type of discussion associated with children in an argument, earlier referred to as chanting. It appears more like a clash of wills than an attempt at compromise.

Modals

Finally, an examination of the distribution of modals reinforces the impression that the students are failing to use language to achieve a cooperative atmosphere. A total of nineteen modals were used with the largest number being 'will' with a total of eight. If we add the 'gonna' and 'shall' to this, we have a total of eleven modals that give a definitive opinion of the future (although Simon's 'shall' could also be interpreted as an offer). There are four uses of 'need' and 'have to' that carry a sense of obligation, and three uses of 'can' that suggest strong possibility. In other words, almost all the modals used carry a sense of strong opinions. Only the one use of 'would' (49) suggests any room for doubt or other possibility. It is interesting to note that there is no use of modals such as 'might' or 'could' which would allow for the possibility of the speaker accepting

other alternatives. Again, we are left with the impression of three individuals working on the same project rather than of a cooperating group. Table 3 summarises the distribution of the data.

Table 3: Distribution of modals

	Tim	Andy	Simon
Can	2	0	1
Have to	0	0	1
Gonna	1	1	0
Need	1	1	1
Shall	0	0	1
Will	1	3	4
Would	0	0	1

Using the insights of S/F Linguistics, we have tried to show that an analysis of the interaction that took place between the three students indicates that, while the students may have eventually completed the group task given, their use of language did not appear to encourage the desired cooperation. We would like to suggest that students need to be made aware of the interpersonal aspects of language use examined here. Students should learn to work efficiently as part of a team, not only because this will help in the learning process at school but also because they will need such skills in their social and working lives. Pedagogical implications are explored in greater depth in the next section.

Section 3 - Ideas for pedagogy

Phillips' (1985: pp. 59-60) words from almost 15 years ago to some extent still portray where many educators are at in regard to group activities:

> During the seventies a highly significant change in attitude to children's talk occurred, a change which moved talk from something to be forbidden to something to be encouraged at all costs. As part of that change, many teachers had moved away from the dominant position at the front of the classroom, which research had shown inhibited children's talk (Barnes, 1969), and had set up situations in which the children could talk to each other freely. By the middle of the decade they were in general agreement with the sociolinguists who suggested that the children's own language should be valued in school (Halliday, 1974; Stubbs, 1976). As the decade finished most teachers were ready to acknowledge that children's talk was 'a good thing!' but they were not quite sure where the talking was going. In the eighties that uncertainty has become more noticeable. It is not that

> those who teach today are any less sensitive to the need to promote children's confidence in using talk, rather the contrary. They have, however, moved beyond the belief that it is sufficient simply to ensure that there is plenty of talk going on, and are looking for ways of promoting children's spoken language development within that framework. They want to know how they might move off the sidelines to intervene constructively in that developmental process. They are looking once again for a teaching role.

Burns and Joyce (1997) make a similar point, maintaining that communicative language teaching's emphasis on use over usage has meant that teachers are happy just to get students talking without furnishing them with sufficient tools for successful interaction. Discussing the need to gain control of these tools as part of first language acquisition, Foley (1991: 17) notes, "The child first of all learns how to communicate in a language and then develops that communicative power to enter into the special discourses which society has created". Taking part in small group interaction in academic situations involves special language skills that need special attention for mastery in one's first language and perhaps even more attention for mastery in a second language.

CL in tandem with S/F may supply part of the answer to how teachers can prepare students to develop this special skill. CL provides useful advice about motivating students to work together well and creating conducive conditions for them to do so. In addition to playing a valuable role in the research on group interaction, perhaps S/F's key contribution to pedagogy can come in the area of collaborative skills, furnishing insights for both teachers and students on how to teach collaborative skills, just as S/F has been used as guide for teaching written genres (Derewianka, 1987; Literacy and Education Research Network, 1990). As Foley (1991: 23) states, "[P]art of education is the process of developing the cognitive strategies involved in effective communication, that is to say strategies to analyse and control discourse".

Johnson and Johnson (1994) suggest a six-step procedure for explicit instruction in collaborative skills as part of CL. They strongly recommend that assuming or hoping that students already have such skills or will somehow develop them because they need to work cooperatively is a recipe for failed group activities. Similarly, Burns and Joyce (1997) urge teachers to use a discourse-based methodology that includes explicit instruction and to follow a scaffolding approach (Vygotsky, 1978) in which students assume more and more responsibility for achieving competence in oral interactions.

The use of a discourse-based approach that focuses on speaking for real purposes, rather than one focusing on decontextualised language fragments and speaking solely as a means of practicing isolated language features helps to ensure that the explicit language instruction is subsumed under a broader emphasis on speaking to communicate. Thus, form serves meaning; meaning

does not take second place to form (Robinson, 1996). Derewianka (1987) and other proponents of a genre approach to writing instruction propose a comparable path, involving a process in which whole texts are used throughout, with learners progressing from comprehending and analysing whole texts created by others, then gradually manipulating those texts and adding more and more of their own language, until they are ready to collaborate with fellow students or to work alone with feedback from others to produce a complete text on their own.

Written and spoken language differ (Halliday, 1989), and more work has been done on the analysis of written language than on spoken genres. Burns (1999b) states that for too long the teaching of speaking has been reliant on language analysis of written texts. This has led to written language becoming the standard with the unfortunate result that "many perfectly normal and regularly occurring utterances made by standard English speakers ... have by omission come to be classified as 'ungrammatical'" (Carter, Hughes, & McCarthy, 1998, p. 67). Fortunately, the 1990s, partly due to technological advances, have seen increased efforts to understand spoken discourse, including projects using computerized corpora (Carter & McCarthy, 1997). Burns (1999a) demonstrates how teachers, using collaborative action research, can analyse spoken discourse and apply their findings to classroom practice.

The first step in teaching collaborative skills, according to the Johnsons, involves helping students see why a particular skill – nominated by the teacher or by students – is important. Likewise, Burns and Joyce (1997) urge teachers to help students understand the purpose of what they are learning, e.g., by asking them about their own experiences, and to help students understand the sociocultural processes involved. The Johnsons' step 2 focuses on helping learners see what is involved in using the skill, the verbal and non-verbal aspects. Burns and Joyce suggest several means of assisting students to notice the relevant language and discourse features, including teacher demonstrations and analysis of transcripts and of video or audio tapes, with both positive and negative examples. All this harmonizes with the concept of consciousness-raising and language awareness. Fotos (1994) demonstrates how group tasks can be used to operationalise this concept.

The Johnsons' third step calls for students to practice the skill in isolation from course content. This fits well with the scaffolded movement to greater learner independence that Burns and Joyce demonstrate, because students can focus just on the one skill without having to worry about other matters at the same time. Role plays, simulations, and games are among the techniques that can be used at this third step. In step four of the Johnsons' six steps, students use the skill when doing regular coursework. In the language classroom, this seems particularly easy to do, because the language of collaborative skills is very much a part of the curriculum (Coelho, 1992, 1994; Foley, 1991; Jacobs & Kline-Liu, 1996). As Coelho (1992, p. 39) states:

> The many parallels between linguistic functions and cooperative group skills suggest that cooperative learning can provide the foundation for a communicative curriculum design. In providing opportunities for students to develop specific group skills, we can focus on the corresponding language functions.

Task-based language teaching, one important direction that communicative language teaching has taken, often uses group activities. Swain and her colleagues (e.g., Kowal & Swain, 1994) have designed communicative tasks that specifically focus on language features. Even if tasks do not have an explicit language emphasis, Foley (1991, p. 36) points out that, "when allied to a framework of a lexico-grammatical system, such as Halliday's function-systemic approach, [task-based teaching] can help solve the difficulty of making the acquisition of a second language meaningful". Carter, Hughes, and McCarthy (1998) urge that the traditional PPP method of presentation, practice, and production be replaced with an III model of illustration, interaction, and induction. Tasks provide fertile soil for such a model. One activity suggested by Burns and Joyce (1997) that might fit this fourth step in teaching collaborative skills is students utilizing a skeleton dialogue as a starting point to carry out a conversation. Another idea comes from Washburn and Christianson (1996) who ask students to work in pairs to practice collaborative skills, such as turn taking and asking for and giving clarification, and to tape record their interaction for future evaluation.

Fifth, the Johnsons strongly recommend that students spend time discussing how well they have worked together and how they might improve next time. One way that Burns and Joyce offer for doing this is for students to record their interaction, transcribe portions, and then analyse the interaction. Kagan (1994) suggests another technique to help students analyse how well they have collaborated. One member of each group serves as observer, noting each time a group member uses the particular collaborative skill on which the group is focusing. Observers can, if possible, also note the language or non-verbal behaviour used in deploying the skill. Based on their analysis of their interaction, groups can decide how to improve the next time they work together.

The sixth step in the Johnsons' procedure involves perseverance in helping students learn to and want to use the collaborative skills. Just as in the genre approach to writing, students are not assumed to be able to become proficient in a particular genre or aspect of a genre after using it once, we cannot assume that one lesson will be sufficient for acquiring spoken collaborative skills. Often, using the skill will feel artificial at first. Burns and Joyce strike a similar chord when they call for the recycling of skills and knowledge, by such means as using different contexts and by gradually increasing the difficulty level by lengthening the interaction, adding more interactants, and asking students to apply their skills outside the classroom.

Can students learn collaborative skills? Two studies suggest this may be possible. Siner (1993), working with British lower primary school students, first attempted to identify those in a class of 21 who were weakest in collaborative skills and lowest in popularity among classmates. A sample of these students were randomly placed in the experimental condition and received collaborative skills training. Students placed in the control condition did not receive such training. Post-training measures of collaborative skills and popularity indicated greater improvement for students in the experimental condition. Bejarano, Levine, Olshtain, and Steiner (1997) report a study in which secondary school Israeli ESL students in the experimental condition received training in the use of small-group interaction strategies, while those in the control condition did not. Results suggest that the training was associated with greater use of such strategies.

The authors of both research reports emphasize the role of language in facilitating cooperation. Siner identifies four stages that the lower primary school students seemed to go through as they learned to collaborate:

> Stage 1: Commentary
> The child comments on what he or she is doing but does not address his/her remark to anyone, e.g., 'a door'.
>
> Stage 2: Commenting
> The child notices what another is doing and comments on it, but in no judgmental way, e.g., 'you've made a car'.
>
> Stage 3: Instructing
> Child interacts with another by instructing him/her to do something, e.g., 'put a roof on'.
>
> Final Stage: Negotiating
> The child becomes fully involved in planning with another, challenging what another has done, justifying his/her own actions, suggesting what happens next, e.g., 'shall we...', 'why don't you ...'.

It seems that the three boys in our transcript were often at Stage 3. This is reminiscent of what Hasan (1988) found in interactions she studied between mothers and children with an average age of less than four. While what Hasan calls High Autonomy Profession mothers tended to be supportive, avoid conflict, give reasons, and use indirect commands, Low Autonomy Profession mothers interacted with their children in more direct, coercive ways, somewhat like what Flick (in Kamen, et al., 1995) called "chanting" among the three boys, as shown in this excerpt from Hasan's data:

Mother: (1) now eat your tea
Karen: (2) try to get my spoon
Mother: (3) you spill that food off that spoon (4) and I'll smack you (5) now eat it

Karen: (6) try to get it --
Mother: (7) I don't want your spoon
Karen: (8) try to get it
Mother: (9) no I don't have to try to get it (10) because I don't want it
Karen: (11) try to get [?the lid]
Mother: (12) no I don't want the lid (13) all I want is for you to eat your tea ... (14) all I want ... is for Karen Megan to eat her tea (15) you're making me upset (16) d'you know that? Hasan, 1988, p. 29, cited in Foley, 1991)

Siner also raises the issue of motivation, suggesting that some students may have the necessary collaborative skills but may decide not to deploy them. Cooperative learning seeks to address the issue of motivation to cooperate in its emphasis on positive interdependence. CL encourages groupmates to feel that they are in a one-for-all all-for-one situation. The various types of positive interdependence explained earlier show the wide range of ways by which this feeling of solidarity can be promoted. Indeed, one well-known and extensively researched approach to CL developed at Johns Hopkins University (Slavin, 1995) believes that if positive interdependence and individual accountability are in place, explicit teaching of collaborative skills, while not harmful, is unnecessary; students will come to cooperate well without such instruction. Siner, citing a study by Pepitone (1985), suggests that culture may play a role. Pepitone found that middle class, urban children had a more individualistic, self orientation, whereas children from a rural culture tended to be more 'other' oriented, more appreciative of the value of collaboration. Siner also points out the cultural influence of the school. Does it encourage student-centredness, cooperation, and mutual support, or does it emphasize teacher-centredness, 'do your own work' and 'let's see who's the best'?

Brislin, Cushner, Cherrie, and Yong (1985) describe how interaction patterns vary across cultures and provide many illustrations of how cultural differences can lead to unsuccessful interactions. Johnson and Johnson (1999) state that although research on CL has been conducted in many countries and cultures with overall findings consistently supporting the use of CL, essential research remains to be done looking into how "different cultures have different definitions of: (a) what is cooperative and competitive, and (b) where each is appropriate" (p. 35). One well-known example of the Johnsons' view is the use of eye contact. Whereas in some cultures, eye contact signals disrespect and conflict, in other cultures it constitutes one part of the non-verbal component of the collaborative skill of attentive listening.

Conclusion

Collaboration is an often ignored and, at times, maligned practice, yet it is fundamental to our everyday existence and our continued survival (Kohn, 1992). Just as we do not assume students will write a persuasive essay that contains the features deemed necessary by various academic and other discourse

communities, neither should we assume that students working in groups will help each other, attempt to persuade each other, and perform other functions in ways deemed appropriate for collaboration in academic and other discourse communities. While the use of group activities does appear to have become more common in education (Jacobs, Crookall, & Thiyaragarajali, 1997), problems with groups abound (Rodgers, 1988) and need our attention.

In this paper, we have explored some of the resources that we educationists now have before us owing to work in cooperative learning and Systemic Functional linguistics, resources that enrich our understanding of how groups work and how they can work better. We should make ourselves aware of these resources and endeavour to expand them. These resources, served to our students with patience and persistence, offer them skills and attitudes they need to harness the power of collaboration in the classroom and beyond.

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Appendix I

Cooperative Learning Mailing List

To become a member of the free list send an e-mail message to:

majordomo@jaring.my

Include in the body of the message:

subscribe CL

That's it! If you want to make a posting to this listserv, just send the message to CL@jaring.my

Websites

1. **Gan Siowck Lee's Home Page for Educators**
   Start here. Gan has compiled lots of good resources on CL, including some of her own work.
   http://pppl.upm.edu.my/~gansl/cl.html

1. **International Association for the Study of Cooperation in Education (IASCE)**. Links to a site with lots of papers on CL and computers
   http://miavx1.acs.muohio.edu/~iascecwis/

1. **Perspectives on Hands-On Science Teaching**
   by David L Haury and Peter Rillero
   http://www.ncrel.org/skrs/areas/issues/content/cntareas/science/eric/eric-toc.htm

1. **Richard Felder's Homepage**
   Richard teaches engineering at North Carolina State (USA) University. Lots of good stuff here related to CL.
   http://www2.ncsu.edu/unity/lockers/users/f/felder/public/RMF.html

1. **Theory and Practice**
   by University of Athabasca, Canada
   http://ccism.pc.athabascau.ca/html/ccism/deresrce/theory.htm

1. **Center for Social Organization of Schools at The Johns Hopkins University** For more than 25 years, the Center has conducted programmatic research to improve the education system, as well as developing curricula and providing technical assistance to help schools use the Center's research. Site includes information on the Center for Research on the Education of Students Placed at Risk (CRESPAR) as

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well as Success For All and Roots & Wings.
http://scov.csos.jhu.edu/

1. **Cooperative Learning Center at the University of Minnesota (USA)**
Co-Directors: Roger T. Johnson and David W. Johnson
http://www.clcrc.com/

1. **Active and Cooperative Learning**
by Bridget M Smyser
http://www.wpi.edu/~isg_501/bridget.html

2. **I is for Interaction - Not Isolation**
Words on Cooperative Learning and Technology
http://137.48.46.72/htmldocs/techcoop.html

1. **Cooperative/Collaborative Learning**
by Susan Ledlow and Neil Davidson
http://www2.emc.maricopa.edu/innovation/CCL/CCL.html

1. **Kagan Cooperative Learning** – This site offers a newsletter, a Q&A section, workshop information, and the chance to by lots of materials of CL and related topics, e.g., Multiple Intelligences.
http://www.kagancooplearn.com/

1. **The Cooperative Learning Network**
The *Cooperative Learning (CL) Network* is an association of colleagues at Sheridan College (USA) who model, share, support, and advocate for the use of *cooperative learning*. It includes the TiCkLe (Technology in Cooperative Learning) Guide.
http://www.sheridanc.on.ca/coop_learn/cooplrn.htm

1. **Computer Supported Collaborative Learning**
This site contains papers from a 1995 conference.
http://www-cscl95.indiana.edu/cscl95/toc.html

1. **Ted Panitz's Homepage**
Ted teaches mathematics at Cape Cod (USA) Community College. His page includes two E-books, one on CL and one on Writing Across the Curriculum. Also included are some of the wide-ranging internet discussions that Ted has put together across several Lists.
http://www.capecod.net/~tpanitz/tedspage

1. **Pete Jones' Home Page**
Pete is Head of Modern Languages at Pine Ridge Secondary School in Ontario, Canada and presents cooperative learning strategies that he and others developed.

http://www.geocities.com/Paris/LeftBank/3852/index.html

1. **Centre for the Study of Learning and Performance** is a research centre at Concordia University, Canada. Their goal is to study and promote effective teaching/learning strategies through active association with schools, administrators, and teachers, particularly in the areas of cooperative learning and integrated technology. See especially the resources page.
   http://doe.concordia.ca/cslp/Try.htm

1. **ERIC Abstracts on Cooperative Learning**
   This site contains selected abstracts on cooperative learning prepared by the Association on Supervision and Curriculum Development (ASCD).
   http://www.ascd.org/services/eric/ericcoo.html

1. **Mid-Atlantic Association for Cooperation in Education (MAACIE).** This organization promotes CL in the Mid-Atlantic region of the United States. The site includes articles from MAACIE's newsletter.
   http://www.geocities.com/~maacie/

1. **Program for Complex Instruction, Stanford University (USA).** This site features the work of Elizabeth Cohen, Rachel Lotan, and their colleagues which has focused on the sociology of groups, in particular the treatment of status differences among group members.
   http://www.stanford.edu/group/pci/

1. **Rikki Ashley's Cooperative Learning Homepage**. Basic information on CL, plus an assortment of activities.
   http://members.home.net/riketa/index.htm

1. **CLUME (Cooperative Learning in Undergraduate Mathematics Education**
   The Mathematical Association of America's Project CLUME is a program for mathematics instructors at all post-secondary levels who are interested in using cooperative learning in their mathematics classes. The site contains an electronic newsletter, math texts suitable for cooperative learning classrooms, ten guidelines for students doing group work in mathematics, suggestions for designing and giving cooperative learning workshops, and responses to a survey on cooperative learning.
   http://www.uwplatt.edu/~clume/

1. **George Jacobs' homepage**. Go to the CL section for a number of articles on CL.
   http://www.geocities.com/Athens/Thebes/1650/index.htm

Appendix 2 - Transcript of the Interaction

1. Simon: [Reaches across and gets some assembled straws and starts taking them apart to redo]

2. Andy: [Works on the base]

3. Tim: [working on the top piece (cone) reaches across table for a pin]

4. Tim: Ouch! [pokes himself with the pin]

5. Tim: I'm making the....[reaches to try cone top on top of the base. Then drops a straw onto the floor and the gets down and picks it up]

6. Simon: Why didn't you put supports here, Andy?

7. Andy: What?

8. Simon: You need to put supports here.

9. Tim: I'm just about to finish the cone top.

10. Simon: Ok but we still can't use it yet.

11. Tim: We can use this cone top.

12. Simon: Not yet though.

13. Tim: I know.

14. Simon: Okay, we have--almost finished the assembly [the piece he has been working on to attach to the base].

15. Simon: [Makes a devilish laugh] Here is Tim's thing now [holds up straws he has been disassembling--hanging down in pieces--Tim glances at Simon and continues working]. Okay.

16. Simon: What are you doing, Andy? [as he has spoken, Andy has been placing braces on the base. Simon jumps up.] This won't work.

17. Sam: [Walks over to table]

18. Sam: What kind of a thing are you trying to build?

19. Simon: This won't work [to Andy]. Andy this won't work [shaking his head].

20. Tim: An earthquake proof [to Sam].

21. Sam: Very Interesting [bends over and says this in false voice. Sam is ignored from here on]

22. Andy: Why [to Simon]?

23. Sam: An earthquake proof?

24. Andy: Why [to Simon]?

25. Simon [answers by showing that his second piece and the main pieces do not fit together].

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26. Sam: It should be earthquake proof otherwise it will go bye-bye.

27. Andy: [Watches, smiles] Oh, yeah [moves his pieces and changes as Simon has suggested].

28. Sam: [Sam leaves]

29. Simon: Okay, now, Unmungh--get off [takes apart piece he is working on], okay..now, I shall make it again, Tim's thing.

Focus Segment

30. Tim: See, here's the cone top.

31. Andy: Well, there's a triangle at the bottom [points to Tim's cone top].

32. Tim: So?

33. Andy: That's gonna be hard to put it on [putting hand on top of existing structure; Tim takes pin out of top joint].

34. Tim: Don't put it here. [talks simultaneously with Simon]

35. Simon: Make a pyramid, make a pyramid out of it. A pyramid.

36. Andy: [Faces and talks to Tim] Cause, look all these are squares--[touches and points around top of existing tower] now.

37. Tim: Yeah, well then we can just put a few supports like that and put it on.

38. Andy: No.

39. Simon: Not really, that is too hard Tim.

40. Andy: It's too hard.

41. Tim: No it isn't.

42. Simon: Yes it is.

43. Tim: You only...need...

44. Andy: It won't look good though.

45. Tim: Yeah, it will.

46. Andy: No, it won't

47. Simon It won't work.

48. Tim: What, you want me to cut it down?

49. Simon: That would work.

50. Andy: Just cut down the bottom...

51. Simon: Just make a pyramid.

52. Andy: Just cut down the bottom...

53. Simon: All you have to do is make a pyramid [attempts to address Andy].

54. Andy: The top..eh..the bottom needs to be square [Speaking to Tim--pointing to Tim's cone top].

55. Tim: Square?

56. Andy: Cause look, all these are squares [points to and touches the base].

57. Tim: I just need one thing to put on.

58. Tim: It's gonna be a small square. [Simon is working on his own piece, away from the conversation].

59. Andy: So we'll make a lot of cubes and make them all smaller.

60. Tim: Ok you guys get started on that, I'm making this.

61. Andy: I'm making cubes.

62. Simon: Make it three layers high, not...[still working on his piece]

63. Tim: Let's make it sort of like the empire state building.